

Balanced sitting posture on forward sloping seat

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Our industrialized society is transforming into an information processing society in which more employees are transacting business while sitting for long periods of time.

With the advent of the information processing age, it is becoming increasingly clear that there is a significant mismatch between people and the furniture in their working environments, as is evident from the increasing numbers of employees suffering from chronic backpain.

The most likely explanation is that we are sitting in the wrong way, thereby abusing our backs, necks and arms.

Experts from all over the world have formerly been of the opinion that the proper sitting position is the right angle or erect position, illustrated by this selection of drawings that form the basis for international standardization, anthropometrics and the training of furniture designers. (fig.1)

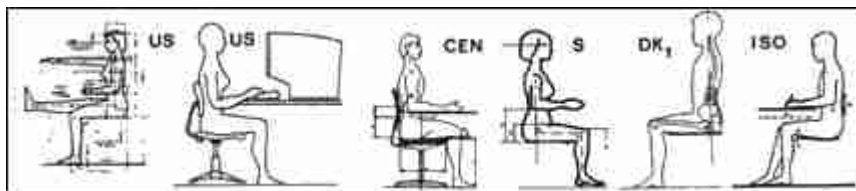
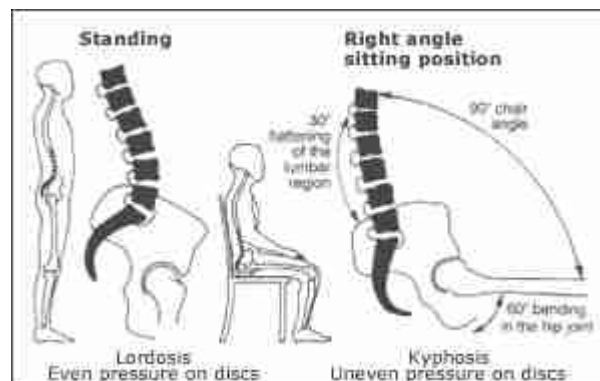


Fig. 1

For the last century, work chairs in schools, factories and offices have been designed for sitting upright, with the hip, knees and ankles all at right angles. *Until recently, it was widely believed that people sat with a 90-degree bending of the hip joint while preserving lordosis (concavity) of the back.*

The erect posture looks very nice, but it is impossible to sit this way for long and there is no scientific basis for it. It is entirely based on wishful thinking, morals and discipline from the days of Queen Victoria. This erect sitting posture cannot be maintained for more than one or two minutes, and usually results in fatigue, discomfort and poor posture. In 1962, the German orthopedic



surgeon, Hanns Schoberth, demonstrated by x-ray photos that in a seated work position, you can only bend about 60 degrees in the hip-joints, not 90 degrees as shown in the drawings in fig.1. This means that when moving from a standing (lordosis) to an upright sitting position, you bend the hip-joints about 60 degrees and rotate the pelvis axis backwards, flattening the lumbar-curve (kyphosis) of the back 30 degrees and straining the muscles of the back. (fig.2) When leaning forward over the desk, you have to bend another 40-50 degrees, and this bending mainly takes place in the 4th and 5th lumbar discs. Even the best lumbar support will hardly have any influence on the posture when leaning over the desk.

Fig. 2

J.J.Keegan, an American Orthopedic surgeon, made in 1953 a series of x-rays of people lying on their sides which documented the large movements that took place in the lumbar section of the spinal column as the position changed from standing (a) to right angle sitting (c) and bent-over positions (d). (b) is the natural resting position, as when you lie on your side while sleeping. The lumbar curve is retained and the muscles are relaxed and well-balanced. (fig.3)

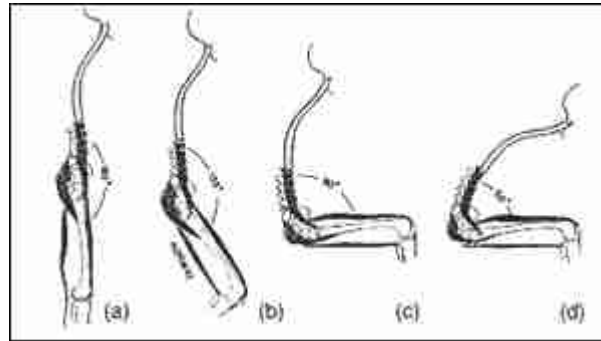


Fig. 3

A sitting posture that approaches the natural resting position (b), is a more suitable position and allows the spine to carry the body weight in a more comfortable way. This is "**Balanced Seating**".

A seat that tilts forward encourages this natural posture. Opposing muscle groups are balanced and the lumbar curve is preserved producing balanced seating in which the back is straight, the joint angles are open and the muscles are relaxed. This position provides greater mobility and relieves pressure on the lungs and stomach.

Children will often tilt forward on the legs of their chair to relieve back pressure. By tilting their chairs forward they avoid bending their backs, allowing the front and back muscles to relax, and thereby sitting in a more comfortable position with a straight back. (fig.4)



Fig.4



Fig.5

While riding a horse, the rider sits upright, yet maintains a lumbar lordosis because the thighs are sloping downwards. This is exactly the same position as the neutral resting position, or sitting on a chair seat that tilts forward. This means the rider is in the perfect position for "**Balanced Seating**". (fig.5)

To further evaluate the effect a forward tilting seat has on the flexion, forward bending, of the back, I conducted an experiment to document the results. To record the changes in the flexion of the various parts of the body, the anatomical points were marked at the knee-joints, hip-joints, 4th lumbar disc and shoulder joints. The participant was seated at a fixed height for the seat and work surface, but the feet were placed incrementally in three different positions in order to simulate different work heights, and the seat and work surface were tilted. To begin with, the girl was positioned at the conventional right angle (Fig.6), whereupon the chair seat and work surface were tilted incrementally and the position of the feet lowered to simulate an increase in the chair and work surface heights (Fig.7 & 8). Fifty photographs of each of 3 positions were taken during a period of 10 days to record the changes in the flexion.

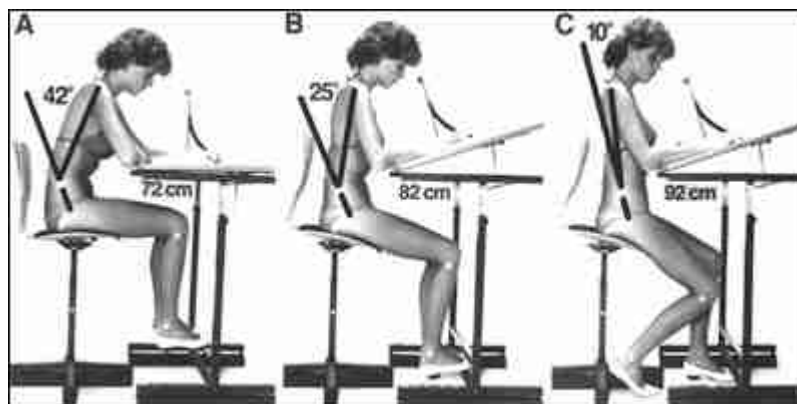


Fig.6

Fig.7

Fig.8

The findings were significant. Flexion, forward bending, in the hip-joint and back was greatly reduced, preserving lordosis in the lumbar region. The final position (Fig. 8) with feet lowered simulating even higher seat and work surface, is exactly the same as the natural resting position where the muscles are relaxed and the body is in a perfect posture for "**Balanced Seating**", the most suitable position for long periods of sitting. Front seat tilt and higher work surfaces are

valuable alternatives that can eliminate lower back strain and ultimately prevent chronic backpain. In this half standing position the disc pressure will of course be very low (Lelong 1986). Furniture should be designed to accomodate the natural resting position, in which opposing muscles are well balanced. The resulting posture will enhance the performance, efficiency and wellbeing of employees.

The recommended chair height is one-third of the person's height, and the desk height one half. Most people with back pain will find this very comfortable, but for the first weeks you will only be able to sit like this for 5-10 minutes, because your back muscles need training. You may also reduce the tension of painful tendons and muscles of the back by moving to the front of the seat of a traditional chair or by using forward-sloping cushion. Most desks are far to low, and this may be improved by placing wooden blocks under the legs.

For further information:

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